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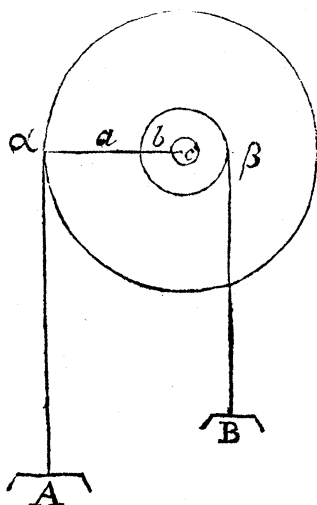
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I. De Pressionibus Ponderum in Machinis motis.

Read at the Royal Society,
June 27, 1754.

A Nimus erat aliquando in legem resistentiæ, quam patiuntur corpora in superficië aquæ mota, inquirendi. Suasit hoc cura, quam dudum mihi imposuit officii ratio, scientiarum nava-
lium, quarum pleræque vel ipsi resistentiæ theoriæ innituntur, vel ita sunt cum eadem connexæ, ut resistentiam ipsam supponant cognitam. Ratiociniis et calculo interdum insuperabili fidere nolui, experimenta licet plurima pro omni casu non sufficere vidi; experimenta cum ratiociniis ea propter conjungere statui, modumque quæsi per experimenta in leges resistentiæ inquirendi.



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Representavi mihi corpus specificè levius aquæ stagnanti ad certam immer-
sum profunditatem, idem-
que filo duas ambiente tro-
cleas potentiæ ita junctum,
ut, hâc suo præpondio ver-
ticaliter descendente, motu
illud horizontali donaretur,
quæsi ex tempore spatio
et ponderibus datis, resisten-
tiam pro quovis corpore de-
terminare.

Non licuit heic, ut mo-
ris est, abstrahere à fric-
tionibus,

tionibus, à rigiditate fili, ab inertia materiæ: introducenda erant hæc omnia in expressione vis acceleratricis, si ducta illa in elementum temporis monstraret verum celeritatis incrementum.

At nemo erat, quantum constitit, qui ita dilucidavit theoriam frictionis ex incrementò preffionis in machinis motis oriundæ, ut nexus cum primis mechanicæ principiis dilucide pateret; quod me invitavit ad indagandam solutionem, quam non ut omni numero perfectam, sed potius ab eruditis et meliora edoctis corrigendam et ulterius perficiendam, Illustrissimæ Societati proponam.

Repræsentat adjecta figura axem in peritrochio. Sit potentia movens A . distantia ipsius à centro motus a . Sit quoque pondus B , ejusque à centro distantia b . Sit radius axis, in quem frictio cadit $= c$. Pondus machinæ $= M$ distantia centri virium a centro gravitatis $= d$. Quæritur jam pressio in axem, cum potentia descendens A machinam agitet.

Si jam pressio oriunda ex descendente potentia A , seu illa qua filum tenditur ad latus α , appelletur π , erit ob actionis et reactionis æqualitatem pressio seu tensio ad alterum latus $\beta = \frac{\pi a}{b}$, unde integra pressio, excluso pondere machinæ funisque, $= \pi + \frac{\pi a}{b} = \left(1 + \frac{a}{b}\right) \pi$. Sit jam constans ratio preffionis ad frictionem ut $1 : \mu$; erit frictio $= \left(1 + \frac{a}{b}\right) \pi \mu$; et momentum hujus frictionis $= \left(1 + \frac{a}{b}\right) c \pi \mu$: momentum vero frictionis ex pondere machinæ $= M c \mu$; quod priori momento adjectum dat $\left(\left(1 + \frac{a}{b}\right) \pi + M\right) c \mu$; unde momentum potentiæ

[3]

moventis = $Aa - Bb - \left(\left(1 + \frac{a}{b} \right) \pi + M \right) c \mu$.

Cum vero momentum inertiae fit $Aa^2 + Bb^2 + Md^2$,

erit vis acceleratrix = $Aa - Bb - \left(\left(1 + \frac{a}{b} \right) \pi + M \right) c \mu$
 $\frac{Aa^2 + Bb^2 + Md^2}{}$

et pro acceleratione puncti α , seu potentiae moventis A , habetur per principia mechanicæ:

$\left(\frac{Aa^2 - Bb - \left(\left(1 + \frac{a}{b} \right) \pi + M \right) ac \mu}{Aa^2 + Bb^2 + Md^2} \right) dt =$

dc ; ubi dt significat elementum temporis; dc vero incrementum velocitatis. Si autem A liberè cecidisset, fuisset $\frac{A}{A} dt = dt'$. Cum autem incrementa

vel decrementa velocitatum eadem temporis particula in eodem corpore genita sint ut vires generantes, licebit inferre ut $dt' : dt' - dc = A : ad$ vim generantem decrementum celeritatis $dt' - dc$, quæ eadem vis est, quæ lapsum corporis retardat, filum tendit, et ad latus α premit; unde substitutis valoribus habetur analogia sequens

$1 : 1 - \frac{Aa^2 - Bb - \left(\left(1 + \frac{a}{b} \right) \pi + M \right) ac \mu}{Aa^2 + Bb^2 + Md^2} = A : \pi$

ideoque $\pi =$

$\frac{ABb^2 + AMd^2 + ABab + \left(\left(1 + \frac{a}{b} \right) \pi + M \right) Aac \mu}{Aa^2 + Bb^2 + Md^2}$

ex qua æquatione invenitur $\pi =$

$\frac{ABb^2 + AMd^2 + ABab + AMac \mu}{Aa^2 + Bb^2 + Md^2 - \left(1 + \frac{a}{b} \right) Aac \mu}$

$$\text{et} \dots \frac{\pi a}{b} = \frac{A B a b + A M d^2 \frac{a}{b} + A B a^2 + A M \frac{a^2 c \mu}{b}}{A a^2 + B b^2 + M d^2 - \left(1 + \frac{a}{b}\right) A a c \mu}$$

$$\text{et pressio integra} = \pi + \frac{\pi a}{b} =$$

$$\frac{A B (a + b)^2 + A M (d^2 + a c \mu) \left(1 + \frac{a}{b}\right)}{A a^2 + B b^2 + M d^2 - \left(1 + \frac{a}{b}\right) A a c \mu}$$

$$A a^2 + B b^2 + M d^2 - \left(1 + \frac{a}{b}\right) A a c \mu$$

Si jam frictionem et pondus machinæ excludere placuerit, habetur pressio integra = $\frac{A B (a + b)^2}{A a^2 + B b^2}$: et si,

ut in troclea evenit, supponatur $a = b$, erit pressio integra = $\frac{A B (a + a)^2}{(A + B) a^2} = 4 \frac{A B}{A + B}$

Christianus Hée,

Professor Mathes. et Phys. Experim. in Statu Navali Hafniensi, Societatum Scient. Hafniensis et Berolinensis Membrum.

II. *An Investigation of a General Rule for the Resolution of Isoperimetrical Problems of all Orders. By Mr. Thomas Simpson, F. R. S.*

Read Jan. 9, 1755. **T**HE different species of problems comprehended under the name of Isoperimetrical ones, are of much greater extent than the name imports; since, not only the determination of the greatest areas and solids, under equal